

WHAT IS CLAIMED IS:

1 1. A method of time scale modification of a digital
2 audio signal comprising the steps of:
3 calculating a discrete Fourier transform of first equally
4 spaced, overlapping time windows having a first overlap
5 amount;
6 partitioning the spectrum into a plurality of contiguous
7 spectral bands according to a Bark scale where each spectral
8 band has an extent dependent upon human frequency perception;
9 identifying a dominant spectral line having the greatest
10 magnitude within each spectral band;
11 calculating a phase difference for the dominant spectral
12 line of each spectral band by a phase vocoder algorithm;
13 calculating a phase difference for each of a
14 predetermined number of spectral lines near the dominant
15 spectral line within each spectral band as the phase
16 difference of the corresponding dominant spectral line;
17 calculating a phase difference for other spectral lines
18 of each spectral band by the phase vocoder algorithm; and
19 calculating an inverse discrete Fourier transform
20 resulting in equally spaced, overlapping time windows having a
21 second overlap amount employing the calculated phase
22 difference for each spectral line, the second overlap selected
23 having a ratio to the first overlap amount to achieve a
24 desired time scale modification.

1 2. The method of claim 1, wherein:
2 the predetermined number of spectral lines near the
3 dominant spectral line is 4 for a 1024-point spectrum.

1 3. The method of claim 1, further comprising the step
2 of:

3 merging nearby spectral lines that are within a
4 predetermined frequency range of each other prior to
5 calculating the phase difference.

1 4. The method of claim 1, wherein:

2 said step of partitioning the spectrum into a plurality
3 of contiguous spectral bands according to a Bark scale employs
4 predetermined spectral bands unrelated to the digital audio
5 signal.

1 5. The method of claim 1, wherein:

2 said step of partitioning the spectrum into a plurality
3 of contiguous spectral bands according to a Bark scale
4 includes adjusting boundaries of spectral bands to maintain
5 important frequency groups within the same spectral band.

1 6. A digital audio apparatus comprising:

2 a source of a digital audio signal;

3 a digital signal processor connected to said source of a
4 digital audio signal programmed to perform time scale
5 modification on the digital audio signal by

6 calculate a discrete Fourier transform of first
7 equally spaced, overlapping time windows having a first
8 overlap amount,

9 partition the spectrum into a plurality of
10 contiguous spectral bands according to a Bark scale where
11 each spectral band has an extent dependent upon human
12 frequency perception,

13 identify a dominant spectral line having the
14 greatest magnitude within each spectral band,
15 calculate a phase difference for the dominant
16 spectral line of each spectral band by a phase vocoder
17 algorithm,
18 calculate a phase difference for each of a
19 predetermined number of spectral lines near the dominant
20 spectral line within each spectral band as the phase
21 difference of the corresponding dominant spectral line;
22 calculate a phase difference for other spectral
23 lines of each spectral band by the phase vocoder
24 algorithm, and
25 calculate an inverse discrete Fourier transform
26 using equally spaced, overlapping time windows having a
27 second overlap amount employing the calculated phase
28 difference for each spectral line thereby forming a time
29 scale modified digital audio signal, the second overlap
30 selected having a ratio to the first overlap amount to
31 achieve a desired time scale modification; and
32 an output device connected to the digital signal
33 processor for outputting the time scale modified digital audio
34 signal.

1 7. The digital audio apparatus of claim 6, wherein:
2 the predetermined number of spectral lines near the
3 dominant spectral line is 4 for a 1024-point spectrum.

1 8. The digital audio apparatus of claim 6, wherein:
2 said digital signal processor is further programmed to
3 merge nearby spectral lines that are within a predetermined

4 frequency range of each other prior to calculating the phase
5 difference.

1 9. The digital audio apparatus of claim 7, wherein:
2 said digital signal processor is programmed to partition
3 the spectrum into a plurality of predetermined spectral bands
4 according to the Bark scale unrelated to the digital audio
5 signal.

1 10. The digital audio apparatus of claim 1, wherein:
2 said digital signal processor is programmed to partition
3 the spectrum into a plurality of contiguous spectral bands by
4 adjusting boundaries of spectral bands to maintain important
5 frequency groups within the same spectral band.